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The Novocain Method of Counting Thrombocytes in Premature Babies, in Newborns, and in Young Children

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The Novocain Method of Counting Thrombocytes in Premature Babies, in Newborns, and in Young Children

Die Novocainmethode der Thrombocytenzählung bei Frühgeborenen, Neugeborenen und Kleinkindern. – La méthode d'innervation thrombocytaire à la novocaïne, appliquée chez les prématurés, nouveau-nés et petits enfants.

By LOUIS BEIS, St. Louis (Missouri) USA.

Introduction.

The methods used in studying and enumerating platelets are many. Under these methods one can differentiate the study of thrombocytes inside the organism and outside of it. The method of studying platelets *in vivo* is confined to animals. For example, the wing of the bat, the mesentery and omentum of the rat, and rabbit, and as well the pia vessels of the cat and guinea-pig. By means of placing a window in the ear of a rabbit, one can study the platelets for a prolonged period of time, while other techniques make it possible to observe the circulation in ordinarily inaccessible organs, such as the spleen and lung of the experimental animal. The mesentery of the curarized frog is especially suited for observations. It is also assumed that platelets do not exist in their usual numbers in lower forms, and that the cells resembling them in physiologic behavior are the thrombocytes (27).

Tocantins mentions that there are one hundred and sixteen different methods of counting platelets (27). In general these methods may be divided into two main classes: 1. those using venous blood, 2. those using blood from a cutaneous puncture. Each one of these may also be subdivided into direct and indirect methods.

Concerning the volumetric measurements of platelets, the best known method is that of *van Allen* (27). The method is similar to the one used in determining the hematocrit and the red cell

volume. According to *Tocantins* (27) the mean platelet volume is 12 microns, and this multiplied by the number of platelets per cubic millimeter of blood and by 100 gives us a percentage volume of platelets of 0.36%. This is also known as the thrombocytocrit. Because of the fact that platelets show a great variation in size, this value naturally is open to question.

The most widely known *method of counting thrombocytes* is the one described by *Fonio* (41), by which a drop of 14% magnesium sulfate is brought to the place where the cutaneous puncture will occur. The drop of blood will be mixed with the magnesium sulfate then a smear will be prepared. After drying, it will be stained with the usual *Pappenheim* stain; and afterwards with *Giemsa* up to one hour. The platelets look small with a pale blue periphery and a darkred granulated center. To arrive at the final total count one compares them with 1000 erythrocytes. According to *Wolf* the normal range is from 150 000 to 300 000 in one cubic millimeter of blood (41).

The normal platelet count per mm³ of blood varies a great deal among authors, and also among the methods used. The following list shows what some authors consider as a normal platelet range:

<i>Hepler</i>	200-400,000	(indirect method, Wright's stain)
<i>Blackfan</i>	200-400,000	(using 3% Na-citrate solution)
<i>Quick</i>	140-400,000	(direct, Na-citrate, formaldehyde)
<i>Brock. J.</i>	200-300,000	(indirect, method of Fonio)
<i>Brock. J.</i>	500-750,000	(using vital stained smears)
<i>Dameshek</i>	500-900,000	(indirect)
<i>Rees-Ecker</i>	225-350,000	(same as Quick, with brilliant cresyl)
<i>Tocantins</i>	133-365,000	(direct, similar to <i>Rees-Ecker</i>)
<i>Olef</i>	650,000	(indirect Method)

The normal count varies also according to age. For example the new-born, the pre-mature infant, and the adult show different values, as will be seen later in this discussion.

Authors do not agree also as to whether there is a difference in platelet concentration during a 24-hour period or not. *Goldeck et al.* (40) proved statistically with the method of *Fonio* that this difference exists, considering of course the degree of error of this method. He found a 100 000 difference between day and night readings. A definite rise during noon, with an acme at 3 : 00 p.m. while the deepest point was at night between 9 and 11 : 00 p.m., was established. *Burmeister and Hansen* (13), however, found no

difference in platelet values during a 24-hour observation; and that digestion has no effect on them. They counted 11 individuals at 8, 9, 12, 13 and at 15 hours; and found no difference, only a variation of 1% among these counts. *Goldeck* however continued at night, and found a difference. He also says that the digestion plays a role in the platelet concentration in the blood. *Benhamon and Nouchy* (54) accept this point of view too, and they call it "plaquettose digestive".

Goldeck is of the opinion that work, seasonal changes as well as surgical procedures, and lumbar punctures influence the thrombocyte levels. *Riticelli* (27) mentions that the thrombocytes level is dependent upon the vegetative nervous system. By means of damaging the floor of the fourth ventricle and the tubero-infundibular regions on experimental animals they have been able to show a rise in the platelet counts.

Giss (27) saw also a rise and fall of the platelets, not bounded by a specific time, but depending on the individual. He showed a five hour individual rhythmus, which was independent of external factors.

Dyke (45) believes that platelets are short lived bodies, thus accounting for the fact that the counts can rise and fall rapidly. They also are utilized and regenerated in enormous numbers daily. Injections of glucose as in the *Staub-Traugott* (Doppel-Belastung-Test) (88) causes within 40 minutes a rise in them up to 100 000.

Pipettes have been also found to be responsible for error in enumerating platelets, as well as in erythrocytes and leucocytes. *Duckrey and Fromme* (72) have found 45% of 68 leucocyte and 19% of the 52 erythrocyte pipettes to have an error under —3%. The rest, namely, 55% of the leucocyte, and 81% of the erythrocyte pipettes have a greater error than tolerated. This makes it imperative that pipettes as well as counting chambers be calibrated before using them for clinical as well as for scientific purposes, and thoroughly inspected for their accuracy.

Dameshek (15) demonstrated that normal adult women show a definite rise of platelets during menstruation. He showed that the counts became extremely elevated during the first day of menstruation, remaining elevated from three to five days then decreasing to a constant intermenstrual status. The peak being reached during the second or third date of menstruation. Non-menstrual women do not show this effect.

The Novocain Method.

The direct methods as well as the diluting solutions that are used in counting platelets are many. Some of them use oxalate or heparin. The method of *Rees and Ecker* (39) uses formaldehyde and citrate. Oxalate, however, has certain disadvantages in that crystalline particles may be confused with platelets.

The use of novocain solution as a diluting, conserving and hemolyzing medium for thrombocytes was a direct discovery of the effects of cocain on the blood (31). It has certain advantages over cocain however, in that it is not habit-forming, and that it is cheaper. The fact that such alcaloids as morphine, strychnine, and cocaine had the effect of rounding-off the formed elements of the blood was known as early as 1900 (31). Later it was discovered that cocain had a lengthening of the coagulation time on extravasated blood, which fact led to the changes in the platelets and to the irretractability of the clot. Later on it was found that cocain had a hemolytic action on the erythrocytes. *Lüdin* (31) studied this effect and saw a maximum hemolysis within a 15-20 minute minimum time.

Here in the hematology laboratory of the Basel Childrens Hospital the method used is as follows:

A solution of novocain 3.5 g., NaCl 0.25 g., and Aqua dest. ad. 100.0 is made up kept in a brown bottle and stored in a refrigerator. The fingertip or heel of the child or infant is washed with ether, then pierced with a lancette. A drop of blood is allowed to collect, then drawn up to 0.5 Mark in a leucocyte pipette. Quickly afterwards it is filled up to Mark 11 with the novocain solution. The pipette is shaken gently a few times to allow a thorough mixing, then rotated in an electric machine. It then is placed in a counting chamber, the same for counting erythrocytes namely the Spenser bright-lined improved *Neubauer*, and allowed to settle for at least twenty minutes inside a Petri dish which has a wet filter paper on the bottom and naturally covered. This time interval is essential for the hemolysis which must occur, and for the reaction of the novocain with the platelets which become rounded-off. The count is made with a binocular microscope using a 43 objective, and a 6 ocular, and permitting very little light to come through the diaphragm. One sees the thrombocytes as very small, round, lighted-up particles which constantly undergo motion in their own place, probably Brownian movement, in contrast to other authors who maintain they are motionless. One counts 80 small squares and multiplies by 1000.

This method was first tried on 15 pre-mature infants, and counts were made every other day for 15 days. Then a group of 11 new-borns was examined every other day for one week. A

TABLE I.
Platelet Counts on Pre-mature Infants.

Name	Number of Platelets						
	Dec. 5	Dec. 8	Dec. 10	Dec. 12	Dec. 15	Dec. 17	Dec. 19
Heinz, A.		158,000	151,000	250,000	359,000	304,000	414,000
Christoph, B.	283,000	259,000	294,000	243,000	238,000	295,000	182,000
Michel, T.	165,000	271,000	366,000	370,000	236,000	287,000	281,000
Ingrid, E.	142,000	302,000	371,000	249,000	247,000	248,000	299,000
Dieter, S.	142,000	210,000	247,000	216,000	245,000	209,000	193,000
Jürg, S.	248,000	350,000	298,000	285,000	287,000	225,000	289,000
Martin, S.	249,000	250,000	311,000	292,000	215,000	259,000	288,000
René, B.	288,000	254,000	339,000	241,000	276,000	240,000	280,000
Marianna, S.	147,000	218,000	200,000	181,000	168,000	148,000	195,000
Marcel, W.	169,000	225,000	344,000	264,000	256,000	200,000	207,000
Isabella, S.	241,000	230,000	249,000	276,000	181,000	212,000	239,000
Marcus, F.	338,000	292,000	292,000	331,000	284,000	318,000	395,000
Regina, B.	379,000	412,000	296,000	201,000	226,000	249,000	273,000
Bruno, D.	340,000	327,000	425,000	375,000	436,000		
Patrik, L.	223,000	400,000	425,000	305,000	439,000	421,000	341,000

TABLE I a.
Age, Sex, Weight, and Length of Above Pre-mature Infants.

Name	Sex	Age in wks before term.	Days of life by first count	Weight in gms at birth	Length in cm at birth
Heinz, A.	♂	3	2	2,500	45
Christoph, B.	♂	2	8	2,400	45
Michel, T.	♂	1	8	1,770	41.5
Ingrid, E.	♀	6	8	2,500	48
Dieter, S.	♂		9	2,080	45
Jürg, S.	♂	7	12	2,070	43
Martin, S.	♂	7	12	2,220	44
René, B.	♂	7	16	2,070	44
Marianna, S.	♀	8	17	1,930	43
Marcel, W.	♂	4	21	2,150	42.5
Isabella, S.	♀	3	22	2,400	46
Marcus, F.	♂	5	29	2,100	45.5
Regina, B.	♀		35	2,050	46
Bruno, D.	♂	3	55	2,000	44.5
Patrick, L.	♂	8	61	1,980	49

second series of 70 counts was made on 70 one-day old infants every day for 7 days. Thirdly, a group of children was examined ranging in ages from 1 to 13 years of age, and having a healthy status. The fourth group consisted of 14 sick children ranging from 2 to 16 years of age, and counts here were made every third day for 20 days.

The purpose of this paper is to determine the validity of this

TABLE II.
Platelet Counts in the First Week of Life.

Name	Sex	Number of Platelets			
		Days of life 1	Days of life 2	Days of life 3	Days of life 4
K. S.	♂	164,000			
S. F.	♀	165,000			
W. T.	♂	196,000			
E. K.	♀	144,000			
K. W.	♂	136,000			
U.	♀	235,000			
H.	♂	152,000			
E.	♀	104,000			
C. V.	♀	179,000			
J. R.	♀	205,000			
A. M.	♀		157,000		
S. S.	♂		162,000		
S. S.	♀		228,000		
L. E.	♂		160,000		
S. F.	♀		124,000		
W. T.	♂		267,000		
W. K.	♂		160,000		
U.	♀		224,000		
H.	♂		146,000		
E.	♀		229,000		
P. Z.	♂			202,000	
K. G.	♀			227,000	
S. B.	♀			187,000	
M. K.	♂			189,000	
S. F.	♀			155,000	
W. T.	♂			224,000	
K. W.	♂			145,000	
E. K.	♀			260,000	
U.	♀			240,000	
E.	♀			215,000	
K. B.	♂				235,000
E. K.	♂				190,000
R. R.	♂				266,000
S. W.	♂				219,000
F. W.	♀				157,000
K. H.	♂				171,000
A. M.	♀				173,000
S. S.	♂				159,000
S. S.	♀				288,000
L. E.	♂				228,000

TABLE II (Continuation)

Name	Sex	Number of Platelets		
		Days of life 5	Days of life 6	Days of life 7
M. A.	♂	160,000		
H. U.	♀	309,000		
K. H.	♂	196,000		
L. B.	♂	171,000		
M. K.	♂	183,000		
S. B.	♀	161,000		
K. G.	♀	230,000		
P. Z.	♂	174,000		
A. M.	♀	151,000		
S. S.	♂	163,000		
H. U.	♀		271,000	
K. H.	♂		225,000	
L. B.	♂		199,000	
K. R.	♂		245,000	
K. E.	♂		214,000	
K. B.	♂		266,000	
M. K.	♂		194,000	
S. B.	♀		205,000	
K. G.	♀		277,000	
P. Z.	♂		162,000	
H. U.	♀			298,000
F. W.	♀			227,000
S. W.	♂			310,000
K. R.	♂			236,000
K. E.	♂			308,000
K. B.	♂			362,000
M. K.	♂			223,000
S. B.	♀			201,000
K. G.	♀			282,000
P. Z.	♂			176,000

method. We wish to compare the results of this method with the results of other methods. The question rises naturally in our minds whether this method gives higher or lower values or equal values than other known methods. Further, we ask how are the platelets in the first day of life, and generally in the first week of life of the healthy new-borns.

Discussion.

The blood samples were taken approximately at five in the afternoon in order to avoid the possibility of the day rhythmus which the platelets show.

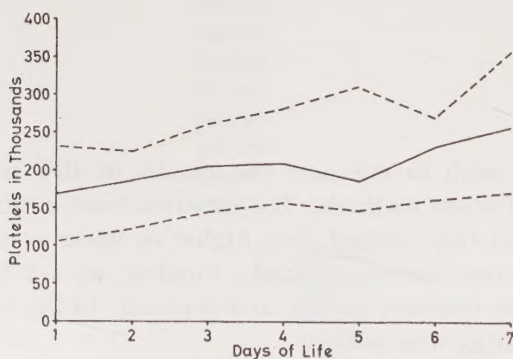
The values of the fifteen pre-mature infants, that we examined showed platelets ranging from 142,000 to 439,000, with an average count of 250,000. There were 102 counts that were made on these 15 pre-mature infants every other day for two weeks. *McLean et al.* (55) gave as an average count working with a group of 10 pre-mature infants from 2 to 9 weeks of age of 246,000. The lowest figures he gave were 152,000, and the highest 358,000.

There were two groups of new-borns that were examined. One group consisted of 70 new-borns, and a total of 70 counts were made. Our lowest value here was 104,000 and the highest was 362,000. For the first week of life, each day we took an average count of 10 healthy new-borns and arrived at the results as seen in Table III. For the first day of life we arrived at the average

TABLE III.
Average Platelet Counts per Day for First Week of Life.

Days	Platelets Average	Minimum	Maximum
1	166,000	104,000	235,000
2	185,000	124,000	229,000
3	204,000	145,000	260,000
4	208,000	157,000	288,000
5	189,000	151,000	309,000
6	235,000	162,000	277,000
7	262,000	176,000	362,000

See also Graph. I.



Graph. I. Graph represents average counts of first week of life with lowest and highest values. Data of Table III.

Fig. I. Veranschaulicht die Durchschnittszahlen der ersten Lebenswoche mit den niedersten und höchsten Werten.

Graphique I. Valeurs moyennes pendant la première semaine et les chiffres extrêmes.

value of 166,000. The platelets increased to 262,000 on the seventh day, as can be seen in this Table and Graph I. The second group of 11 new-borns show a variation of platelets ranging from 150,000 to 300,000. The average count of the first day of life here is 204,000, the lowest 155,000 and the highest reaching to 259,000. The average of these two figures as given by these two groups for the first day of life gives us the average figure of 185,000 and a distribution range from 150,000 to 300,000.

Merritt and Davidson studied platelets on new-borns as well as in infants up to one year. They showed an average platelet count for the first day of life of 230,000, whereas we show an average count of 185,200, for the first day of life. Our method then gives us results of 45,000 platelets lower than the method of *Meritt and Davidson* (49) for the first day of life. From their graph one sees that the platelets slowly rise in the first month of life, then reach a peak about the third month of life, and remain there with oscillations for the first year of life.

A third group of 30 healthy children was examined for thrombocytes. These children had no history of any infectious or blood disease. The lowest figure here was seen to be 126,000, and the highest of 356,000. The average value of 224,900 was deduced from a total count of 30.

The ages of these children vary from 1 to 13 years as can be seen in Table IV. We cannot compare our figures with the ones plotted by *Merritt and Davidson* in their graph, because of the age differences. Nevertheless, from their graph we can deduce an

TABLE IV.
Platelet Counts on Infants the First Week of Life.

Name	Sex	Weight in gms	Length in cm	Number of platelets				
				Days of life 1	Days of life 3	Days of life 4	Days of life 6	Days of life 8
H. M.	♂	3,120	48.5	249,000	243,000		197,000	
I. S.	♂	3,750	52	239,000	161,000		99,000	
T. R.	♂	3,500	51	175,000	241,000		273,000	
M. E.	♀	4,890	54.5	185,000	200,000		290,000	328,000
M. T.	♀	2,900	49	258,000	281,000		268,000	307,000
M. G.	♂	3,930	51	259,000	248,000		185,000	206,000
A. W.	♂	3,500	50.5	258,000	200,000		192,000	152,000
T. Z.	♀	2,850	51	158,000	162,000		150,000	
M. S.	♂	3,750	51	160,000	151,000		235,000	
A. M.	♀	2,900	51	155,000	185,000	192,000	151,000	
O. H.	♀	3,050	51	173,000	198,000	234,000	215,000	

average count of 325,000. *Lucas and Fleischner* (55) give the normal for children as 250,000 average count with a variation from 200,000 to 400,000. Our method then gives us on the average 22,000 lower thrombocytes than the values of *Lucas and Fleishner* (55). Expressed in per cent, it amounts to 9% lower.

Finally, a fourth group of children was examined. The children here varied in age from 3 to 16 years of age. Two cases of lymphatic leucaemia, one of a thrombopathic disease, and certain infectious diseases as: scarlet fever, pertussis, pneumonie, and recidive rheumatic carditis. Three interesting case histories are the following:

CASE 1. Marianne B., an 8-year-old girl, was admitted on 8. 12. 1958 with the diagnosis of leucemia. From the family history: 1 sister 16 years and another 10 years are healthy. The parents are healthy, and no history of blood diseases in the family.

On 28. 11. 1958 she noticed pains in her throat, tonsillitis, and a pharyngitis similar to a Pfeiffer, with much thirst. On 7. 12. 1958 an internist found 64,000 leucocytes in her blood, and admitted her as a leucemia.

Status: The girl appeared pale, was reduced in general condition and exsiccotic. Subconjunctival bleedings. Purpura over the abdomen, and chest. Both nostrils were filled with bloody mucous. Bleeding of the pharynx and tonsills, positive meningismus, and soft palpable glands in the neck and axilla. The abdomen was hard. The liver much enlarged, 10 cm. below the rib cage, hard, and slightly painful. The spleen also was much enlarged, 8 cm.

TABLE V.
Platelet Counts on Healthy Young Children.

Name	Age yrs.	Sex	Platelets	Name	Age yrs.	Sex	Platelets
L. D.	2	♀	231,000	T. W.	6	♂	164,000
R. W.	1½	♀	356,000	H. K.	11	♀	274,000
U. J.	1	♂	260,000	G. H.	11	♀	239,000
U. U.	1	♀	259,000	B. S.	9	♀	260,000
A. U.	8	♂	260,000	B. S.	12	♂	291,000
F. A.	5	♀	161,000	V. R.	3½	♂	126,000
P. R.	3	♂	211,000	F. H.	8	♀	192,000
M. C.	2	♂	307,000	A. H.	7	♀	202,000
P. H.	4½	♂	230,000	M. E.	6	♀	257,000
C. G.	5	♀	223,000	A. K.	9	♀	201,000
I. G.	2	♀	226,000	E. W.	4	♂	182,000
M. A.	10	♂	201,000	K. V.	13	♂	171,000
K. J.	2½	♂	238,000	R. Z.	5	♂	194,000
F. S.	13	♂	214,000	A. S.	8	♂	179,000
E. B.	7	♂	248,000	R. S.	5	♂	190,000

Average: 224,900

TABLE VI.
Platelet Counts Found by Sick Children from 2 to 16 Years of Age.

Name	Number of Platelets						
	Dec. 5	Dec. 8	Dec. 12	Dec. 15	Dec. 19	Dec. 22	Dec. 24
Jeanette, H.	292,000	308,000	184,000	193,000	230,000	256,000	
René, H.	199,000	251,000	210,000	158,000	150,000	158,000	147,000
Markus, A.	324,000	214,000	230,000	188,000			
Heinz, H.	291,000	215,000					
Marianne, B.	28,000	33,000	62,000	29,000			
Werner, B.	252,000	240,000	188,000	229,000	259,000	303,000	340,000
Franz, U.	165,000	154,000	198,000	152,000	189,000	189,000	202,000
Pierre, H.	264,000	170,000	147,000	142,000	159,000	158,000	174,000
	Dec. 6	Dec. 9	Dec. 13	Dec. 16	Dec. 19	Dec. 22	Dec. 24
Liselotte, H.	128,000	207,000	270,000	282,000	329,000	389,000	378,000
Leonore, H.	283,000	270,000	330,000	231,000	257,000	286,000	
Martin, H.	272,000	356,000	298,000	186,000	258,000	191,000	
Elfriede, A.	112,000	138,000	317,000	277,000	305,000	194,000	206,000
Madelaine, K.	132,000	165,000	205,000	136,000	154,000	143,000	194,000
Edith, B.	340,000						
Peter, H.	346,000	278,000	275,000	259,000	273,000	334,000	307,000

Further Data Concerning Table VI.

Name	Age	Diagnosis
Jeanette, H.	3	Scarlet fever
René, H.	4	Scarlet fever
Markus, A.	6	Pertussis
Heinz, H.	3	Pertussis
Marianna, B.	8	Lymphatic leucaemia
Werner, B.	6	Acute glomerulonephritis
Franz, U.	11	Nephrolithiasis with Hydronephrosis
Pierre, H.	12	Pneumonie
Liselotte, H.	4½	Serious Dystrophy, Hirsutismus, Neuropathy
Leonore, H.	16	Rheumatic recurring carditis, Aorteninsufficiency, and Mitral insufficiency, multiple dental granulomes, lipodystrophy, Anaemia
Martin, J.	3	Lymphatic leucaemia in remission
Madelaine, K.	8	Neuropathy, Enuresis
Peter, H.	8	Chronic Adenoiditis, Viridans streptococcal sepsis
Edith, B.	7	Acetomie vomiting, Pharyngo-tonsillitis acuta

Diagnosis: Acute lymphatic leucemia, strong hepato-splenomegaly, hemorrhagic diathesis, enlargement of the glands, anemia, and afebrility.

Course: Under 90 mg. Meticorten, or 3 mg./kg. and 1 g. Aureomycin there was a good improvement to be seen. Then 60, and 40 mg. of the Meticorten were given, but a remission could not be brought about. On 17.1.1959 was Exitus. The thrombocytes in this girl were very low, 28,000, and the maximum they reached was 62,000. The hemorrhagic diathesis could not be combatted.

The sternal puncture also showed very few megakaryocytes, and having very few cells. The lymphocytes had a thin layer of protoplasm with naked nuclei. The monocytes showed a lobulated nucleus.

CASE 2. Martin J., a 3-year-old boy, was admitted on the 29.10.1958. The family history is healthy. He has 6 sisters, all of whom are healthy.

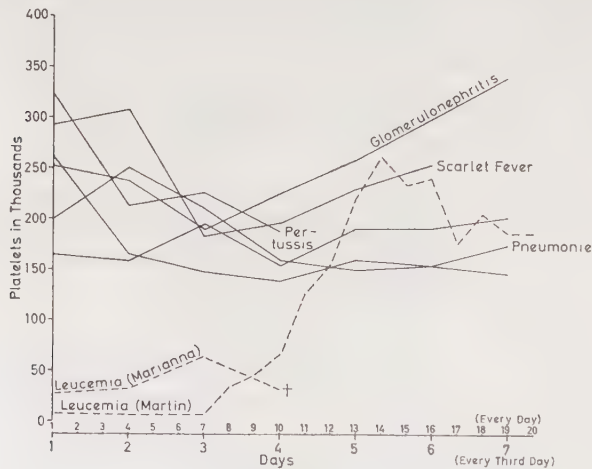
Status: Pastous habitus. Multiple purpura on both cheeks, chin and extremities. Multiple suggillations over the whole body. Submucous bleedings of the mouth and lips. The liver and spleen were palpable below the rib cage, two fingers wide.

Diagnosis: Purpura by thrombopenia. Lymphatic leucemia.

Course: With 45 mg. Meticorten and 450 mg. Ilcycin. An reticulocyte crisis was reached with 134% on 13.11.1958 and marked improvement seen. On 7.11.1958 a secondary Cushing developed, and the skin and mucosa bleedings ceased. On 23.1.1959 permission was granted to leave the hospital, and always to remain in contact with a physician or the hospital. By dismissal no bleedings from the nose and pharynx were seen. The spleen was not palpable, the liver slightly below the ribs.

Here we see the definite rise of the platelets from 4,000 on 29.10.1958 to a definite rise to 272,000 on 6.1.1959. Here we seen the Meticorten causing a remission, a rise of the platelets follows, and abolition of the hemorrhagic condition. The sternal puncture in this case war rich in cellular structure, in contrast to the previous one.

CASE 3. Peter H., a 8-year-old boy, was admitted on 4.12.1958 because of profuse nose bleedings. He had already been hospitalized previously for this



Graph. II. Shows difference in platelets between the leucemias and infectious diseases, also the different courses of the two leucemias.

Fig. II. Zeigt den Unterschied der Plättchenzahlen zwischen Leukämien und infektiösen Erkrankungen sowie die Unterschiede zwischen zwei Leukämien.

Graphique II. Différences thrombocytaires entre leucémies et maladies infectieuses et les évolutions des deux leucémies.

condition. Due to blow on the right cheek a bleeding occurred. Peter also had a temperature of 40.4°C , and was admitted as a status febrilis. The diagnosis was a chronic adenoiditis with viridans streptococcal sepsis and intermittent fever. The platelet count was over 230,000, but their agglutination failed. There was an anisocytosis of the thrombocytes, which showed pycnotic granula and seldom vacuoles. The coagulation time was definitely long, 8 Minutes. The heparin tolerance and recalcification time of Howell were lengthened. The picture presented itself as a mixed form of a hemorrhagic disease, thrombasthenia and thrombopathy. With many millions of Megacillin, Streptomycin, ferronicum, a therapy was brought about, and leave was granted on 28. 1. 1959.

Conclusions.

Platelets have been counted by the novocain method in four various age groups; namely, in pre-mature infants, new-borns, in healthy children, and in a group of children with some pathologic blood picture and infections.

Our average platelet counts in pre-mature infants is 250,000 and that of *McLean* (55) is 246,000. A very good correlation is therefore seen.

Concerning the new-borns, we have one group of 70 and another of 11. The first group shows that of 10 counts for the first day of life, we arrive at an average of 166,000. The second group here, shows us out of 11 counts an average of 204,000. The average of these two counts gives an average of 185,200 for the first day of life. *Merritt and Davidson* (49) reports with his method an average count of 230,000 for the first day of life. A difference therefore of 45,000. Our method gives us 19.6% lower values than the one used by the above authors, that is if one uses the 1-day-old new-borns as a reference point.

An average count of 228,000 was arrived at on 30 healthy young children ranging in age from 1 to 13 years. From the values cited by *Lucas and Fleishner* (55) for this age group we see an average count of 250,000. Our method then gives us on the average 22,000 platelet values lower than the one of these authors. Expressed as percentage, it gives us 9% lower values. We see here also a close correlation.

The thrombopenia is evident in the two cases of leucaemia presented, and in one a remission is seen to run parallel with a rise of thrombocytes.

Concerning the last group of children examined with infectious diseases, no significant effect was seen, as confirmed also by

McLean and co-workers (3) who examined 173 infants and young children with acute infections.

Summary.

The general properties of platelets were discussed, and the various methods for their enumeration cited. Primarily, we were concerned with proving the validity of the novocain method. We have seen that this method as all direct methods has the disadvantage that of being a quantitative Method, not being able to inform us at all about the qualitative structure of the thrombocytes.

Our method established as an average count by the pre-mature infants we examined of 250,000, and with minimal and maximal values of 142,000 to 439,000 platelets per mm³ respectively.

By the new-borns cited we arrived in the first-day of life of average counts of 185,000 and highest and lowest values ranging from 362,000 to 104,000 respectively.

By 30 counts on healthy children an average count was established of 228,000, with a distribution range from 161,000 to 356,000.

Our method also proved the thrombopenia in the two cases of leucemia, as well as the one with a remission.

It therefore, has shown us evidence of its validity as a means of enumerating platelets. It is also an easy method to learn, not difficult to carry out, and not time-consuming.

Zusammenfassung

Die Novocainmethode gibt keine Aufschlüsse über die morphologische Struktur der Thrombocyten. Bei Frühgeborenen wurden durchschnittlich 250 000 Plättchen gefunden, maximal 439 000, minimal 142 000. Bei Neugeborenen betrug die Zahl am ersten Lebenstag durchschnittlich 185 000 (maximal 362 000, minimal 104 000). Bei 30 gesunden Kindern fanden sich durchschnittlich 228 000 (Streuung von 161 000 bis 356 000). Zwei Thrombopenien bei Leukämie sowie ein Remissionsstadium kamen gut zum Ausdruck. Die Methode ist handlich, einfach und zeitsparend.

Résumé

Les différentes particularités des thrombocytes et les diverses méthodes de leur énumération, sont discutées. Tout d'abord, il

s'est agi de prouver la valeur de la méthode à la novocaïne. Comme toutes les méthodes directes, elle a le désavantage en tant que méthode quantitative, de ne pas nous renseigner sur les propriétés structurales des thrombocytes.

Notre méthode a donné comme valeur moyenne 250.000 thrombocytes chez nos prématurés examinés, avec des chiffres minima et maxima de 132.000 et 439.000 plaquettes par mmc.

Chez les nouveau-nés, la moyenne du premier jour était de 185.000 thrombocytes ; la valeur la plus élevée et la plus basse était de 362.000, voire 104.000 plaquettes.

30 déterminations effectuées chez des enfants bien portants ont donné la moyenne de 228.000, avec des valeurs extrêmes de 161.000 et 356.000.

Notre méthode a également mis en évidence une thrombopénie dans 2 cas de leucémie, ainsi que celle rencontrée pendant une rémission.

Cette méthode paraît donc utile pour la détermination des plaquettes sanguines. Elle est facile à apprendre, à exécuter et elle s'avère être rapide.

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Curriculum Vitae

Ich, Louis Dimitrios Beis, bin am 18. April 1927 in Sopike, Gjinokastre, Albania, geboren, auch Nördlicher Epirus genannt. Dort habe ich meine ersten 5 Schulklassen absolviert. Im Jahre 1940 bin ich nach den Vereinigten Staaten ausgewandert, nach St. Louis, Missouri, wo ich derzeit wohnhaft bin. Von 1940 bis 1943 besuchte ich die Samuel Cupples Public School, und von 1943 bis 1947 war ich im Christian Brothers College High School. Vom Juni 1945 bis November 1946 habe ich Militärdienst gemacht. Von 1947 bis 1950 besuchte ich die Washington University, und im Juni 1950 habe ich das A. B.-Diplom bekommen. Im Jahre 1952 kam ich nach Basel, und im Frühling 1955 habe ich hier die anatomisch-physiologische Prüfung bestanden. Im November 1958 konnte ich an der Universität Basel schließlich meine «Fachprüfung für Ärzte» mit Erfolg ablegen.

